REMARKS

All pending claims 1-19 currently stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claims the subject matter, which Applicant regards as the invention. Accordingly, typographical errors on Pages 4 and 5 of the description have been corrected so that the introductory text is consistent with the embodiments detailed in the remainder of the description, as well as the claims. Applicant submits that the typographical errors may have been caused by confusion over numbering of the input/output ports. In the introductory text the port designated the "second port" initially represented a port opposite the "first" port, whereas in the remainder of the description the "second" port actually indicates the port, which is located adjacent the "first" port.

All pending claims 1-19 currently stand rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement.

After clarifying pages 4 and 5 of the description, Applicant would like to draw the Examiner's attention to pages 7, 8 and 9 of the description, which contains a clear description of the routing means in accordance with claims 1 and 14 of the present application.

[0039] FIG. 5 illustrates one embodiment of a wavelength interleaving cross-connect having multiple half wave plates and two birefringent elements. The

elements of FIG. 5, with the exception of I/O ports 310, 320, 330 and 340, represent one embodiment of wavelength interleaving cross connect 300.

[0040] In general, odd channels ("first subset") *received via port 310* ("first port") *are directed to port 330* ("third port"), *and even channels* ("second subset") *received via port 310* ("first port") *are directed to port 340* ("fourth port"). *Odd channels* ("first subset") *received via port 320* ("second port") *are directed to port 340* ("fourth port"), *and even channels* ("second subset") *received via port 320* ("second port") *are directed to port 330* ("third port"). *In one embodiment, to operate as described above with respect to FIGS. 3 and 4 odd channels are input to port 310 and even channels are input to port 320. In an alternate embodiment, even channels are input to port 310 and odd channels are input to port 320.*

[041] The half wave plate 510, a first birefringent element 550, a half wave plate 515, a second birefringent element 555, and a half wave plate 520 together operate as a filtering element to filter optical signals that pass therethrough. In one embodiment, the first birefringent element 550 has an optical path length of L and the second birefringent element 555 has an optical path length of 2L. In one embodiment, the filtering effect of half wave plates 510 (e.g. @ 22.5°), 515(e.g. @ 52.5°) and 520(e.g. @ 3.5°) and of birefringent elements 550 and 555 provides a comb function in both directions; however, other filtering functions can also be provided. Preferably, the polarization of a first set of frequencies (e.g. ITU even channels) is rotated by 90°, while the polarization of a second set of frequencies (e.g. ITU odd channels) is unaffected. This difference in response typically provides the opportunity for the odd and even numbered channels launched via the same input port to be directed to different ports; however, in the present invention it also enables the odd and even numbered channels launched via different input ports to be directed to the same output port. Of course, all of this depends on the relative polarizations of the odd and even channels when they are input into the device, and how their polarizations are otherwise manipulated within the system.

[042] In one embodiment, the first and second birefringent elements 550 and 555 are composed of multiple birefringent crystals that are selected to provide improved thermal stability over a range of operating temperatures as compared to a single birefringent crystal. In one embodiment, one crystal is

a TiO_2 crystal and a second crystal is a YVO_4 crystal; however, other crystal types can also be used. Other birefringent assemblies can also be used, for example, a single crystal can be used if temperature stability is not important.

[043] For the sake of example we will assume that the even numbered channels, are input the port 320 and the odd numbered channels are input the port 310. The components of the optical signal comprising even numbered channels launched via port 320 emerge from the half wave plate 520 in the orthogonal polarization state as when they entered half wave plate 510, and therefore pass through a polarization beam splitter 560 to a half wave plate 530 and to the port 330. Assuming that the port 330 is optically coupled to port 340 via an optical device of some kind, the even channels received via the port 340 will travel through the cross-connect 300 in a similar manner; however, a waveplate 540 is used to ensure that the polarization of the even channel components beginning the second pass is orthogonal to their polarization after the first pass. Accordingly, the even channels will get reflected by the prism 560 and directed to the waveplate 520. Once again, passage through the first and second birefringent elements 550 and 555 results in a polarization rotation enabling the even channel components to pass through the prism 540 to the port 310.

[044] Moreover, it is preferable for the signals that pass in a first direction (e.g. left to right) to exit the waveplate 520 with a polarization that is orthogonal to the signals of the same frequency set re-entering the waveplate 520 for a second pass in a second direction (e.g. right to left). The orthogonal relationship between the passes reduces, or even eliminates chromatic dispersion for signals that are passed from the port 310 to the port 330, through an optical device to the port 340 and then to the port 320.

[045] One of the components (e.g. the ordinary component) of the odd numbered channels received via the port 310 is directed to the filtering elements through a half wave plate 500, which ensures that the polarization of the odd channel components is orthogonal to the polarization of the even channel components launched via the port 320, and that the components of the odd numbered channels are passed directly through the polarization beam splitter prism 540 to the waveplate 510. The polarization of the odd channels is unaffected as a result of passing through the filtering elements 550 and 555.

Accordingly, the odd channels are directed to port 330 after passing directly through the polarization beam splitter 560. The half wave plate 530 rotates the polarization of one of the odd channel components, whereby they can be combined in a walk-off crystal provided in the port 330.

[046] The odd channels received via the port 340 are processed in a similar manner as the odd channel signals launched via the port 310, except that the waveplate 540 rotates the polarization of one of the components thereof (e.g. extraordinary component) resulting in the odd channel components being reflected by the prism 560 and re-entering the waveplate 520 with a polarization orthogonal to the polarization of the odd channel components exiting the waveplate 520 after the first pass. As a result of passing through the first and second filtering elements 550 and 555 a second time, the polarization of the odd channel components is again unaffected, which enables the odd channel components to be reflected by the prism 540 to the port 320. As with the even channels described above, an orthogonal relationship between signals that pass in a first direction and in a second direction can reduce, or even eliminate, chromatic dispersion.

Accordingly, the description provides a clear example of a routing means that directs channels of a first subset of optical frequencies (odd) between a first port and a third port and between a second port and a fourth port, and that directs channels of a second subset of optical frequencies (even) between a first port and a fourth port and between a second port and a third port. In the example repeated above, the routing means is comprised of birefringent crystals of a desired length with waveplates therebetween for reorienting the polarization of the light. A person skilled in the art of birefringent crystal interleavers would clearly be enabled to make and use the present invention as described therein. Similarly, a person skilled in

the art of GT etalons would be able to make and use the embodiment illustrated in Figure 8, and a person skilled in the art of multi-cavity etalons would be able to make and use the embodiment illustrated in Figure 10.

A holding to this effect and the allowance of this application followed by its passage to issuance is respectfully solicited.

If, however, any issues remain, the Examiner is invited to call Applicant's undersigned counsel so that a brief interview can be arranged to resolve these issues.

It is believed no fee is due at this time. If that determination should be incorrect, then please debit Deposit Account No. 50-0644 and notify the undersigned.

Respectfully submitted,

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GEOFFREY R. MYERS REG. 24,897 DATE

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